

Applica'ons of Earth Remote Sensing for Severe Weather and Damage Assessment

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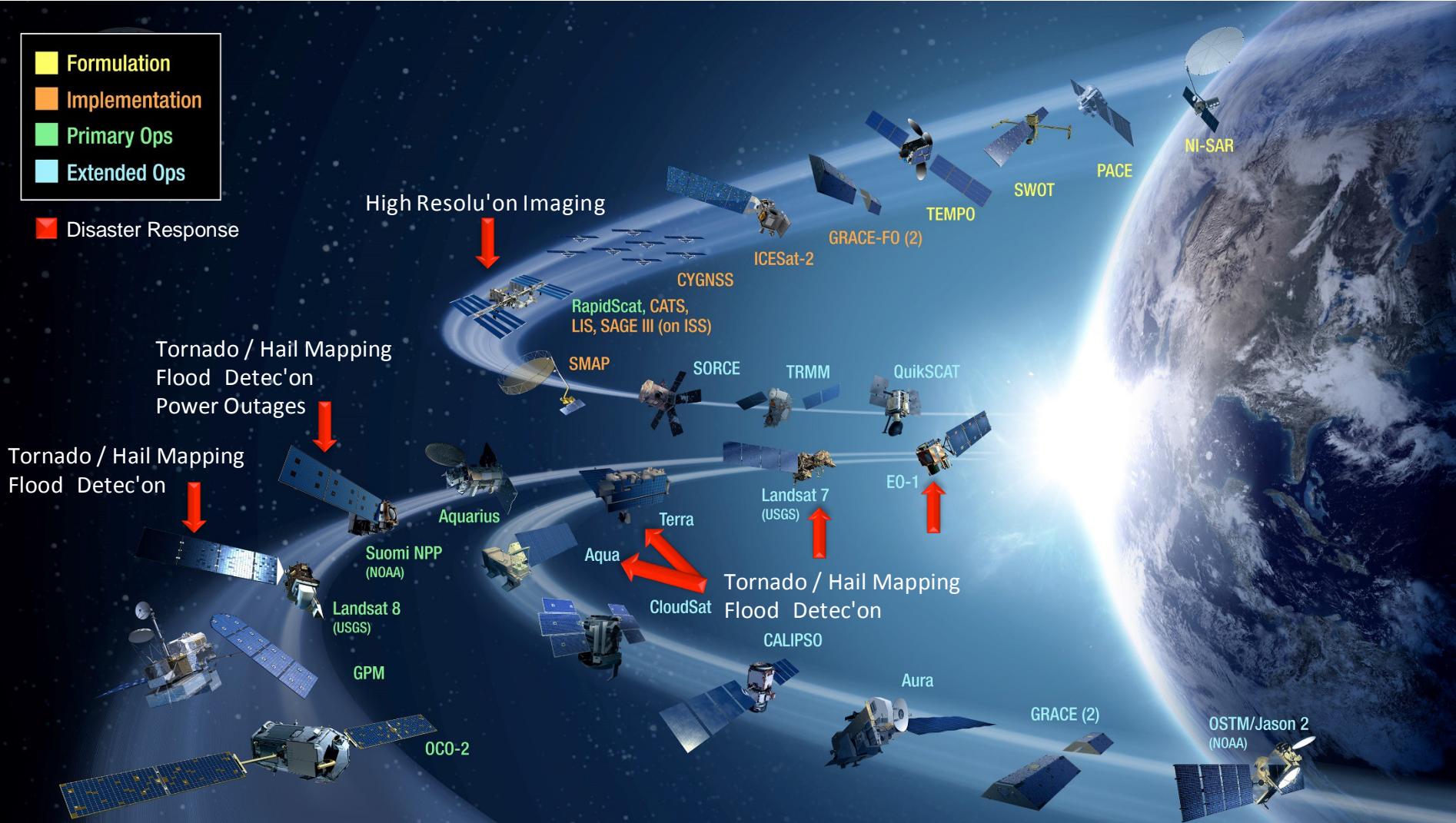
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27th Conference on Weather Analysis and Forecas'ng – Chicago, IL



NASA Missions and *SPORT* Applications



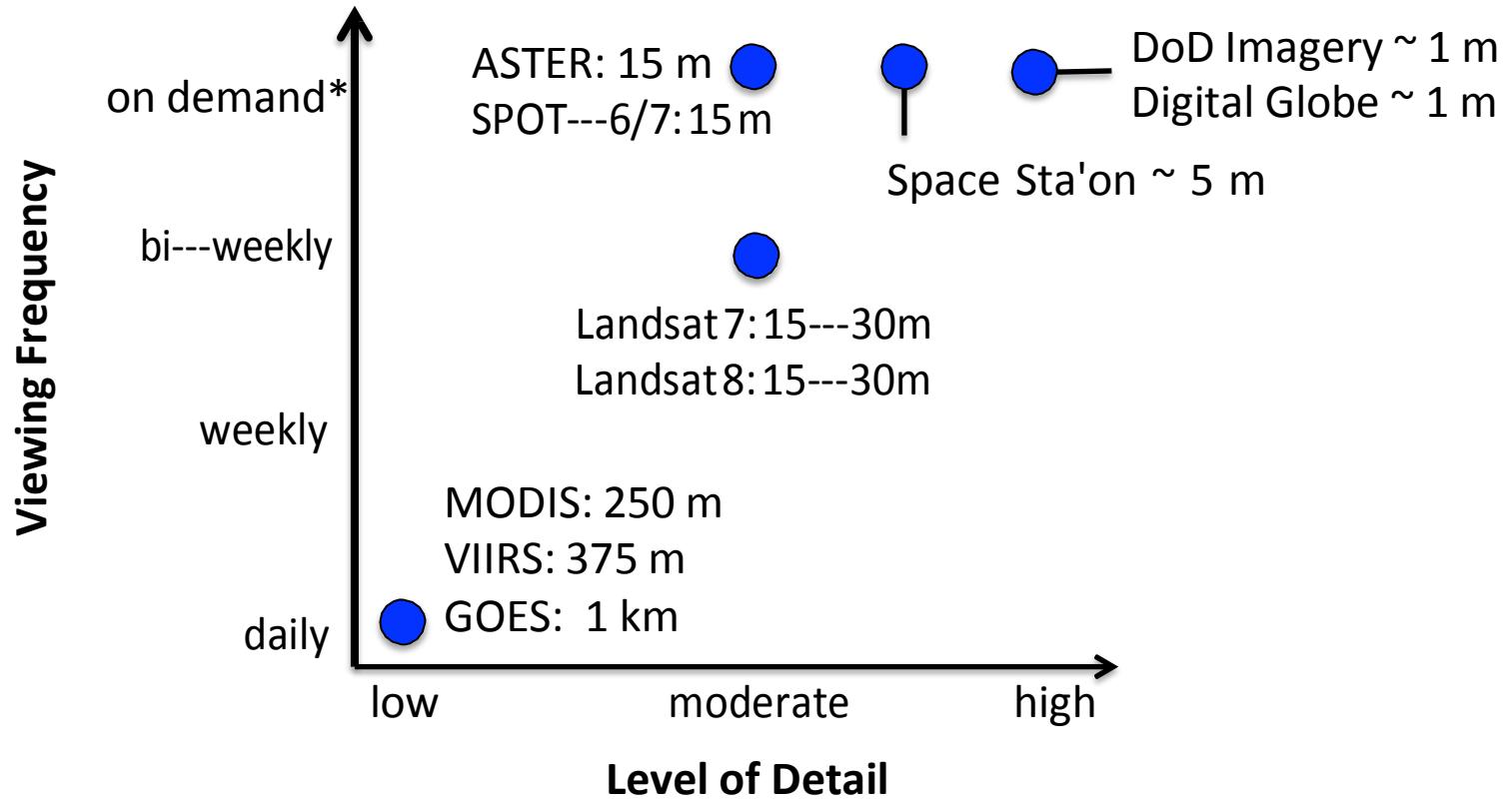
Satellite Products

Platform	Sensor	Product	Resolution	Repeat Cycle	Source
Terra / Aqua	MODIS	NDVI True Color	250 m 500 m	Daily	Direct Broadcast (CIMSS) NASA LANCE
Suomi NPP	VIIRS	NDVI True Color Day--Night Band	375 m 375 m 750 m	Daily	Direct Broadcast (CIMSS) NASA SIPS / LANCE (TBD)
Landsat 7 Landsat 8	ETM+ OLI	Natural Color NDVI	30 m	16 Days	USGS Earth Explorer
Terra	ASTER	False Color NDVI	15 m	On Demand	ASTER Expedited USGS Earth Explorer
International Space Station	ISERV	True Color	5 m	On Demand	SERVIR Project at MSFC
Commercial / International	Varies	Panchromatic True Color	< 1 m 1 m	On Demand	USGS Hazards Data Distribution System

Latency of products vary by type of imagery and source. Through partners, we provide a broad range of sensors for post---storm analysis. Data can be used by surveyors up to 60 days after the event.



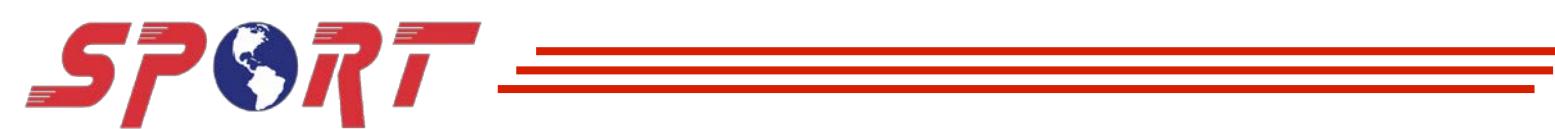
Satellite Products



*on demand products are managed by request through USGS Hazards Data Distribution System

NASA Applied Sciences Project

- Following the April 27, 2011 severe weather outbreak across the southeastern U.S., the SPoRT team provided MODIS and ASTER imagery to NWS forecast offices in Alabama
 - Imagery was used to refine and adjust some tornado tracks, particularly those that crossed CWA boundaries or were in areas with limited road access
- SPoRT was awarded a NASA Applied Science: Disasters “Feasibility” award to pursue inclusion of Earth remote sensing imagery and derived products within the NOAA/NWS Damage Assessment Toolkit

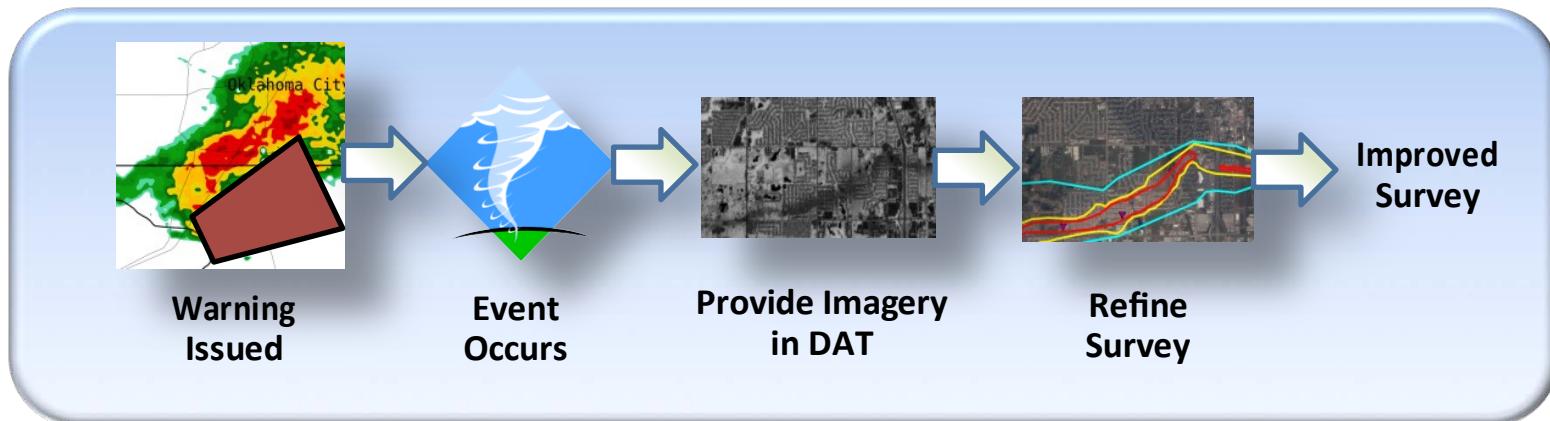
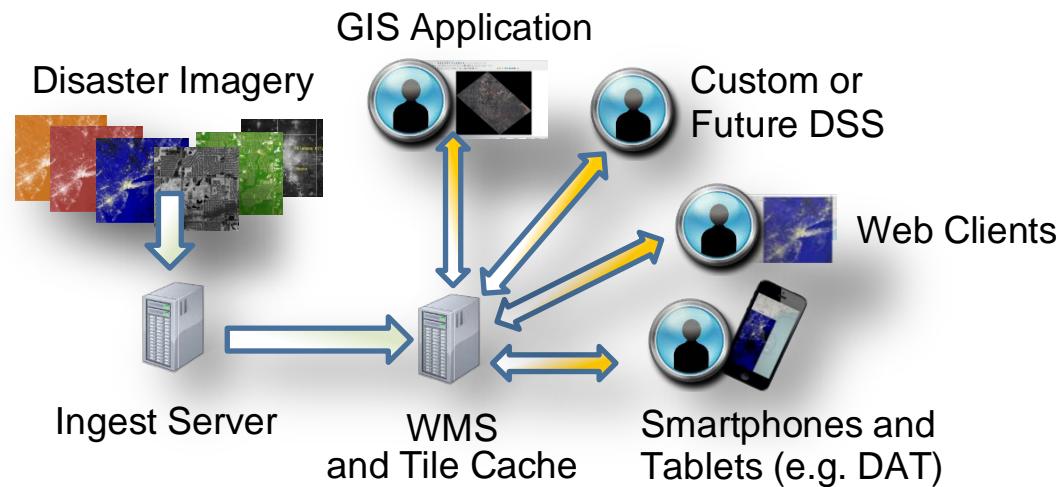


Data Integra'on

- NOAA/NWS Damage Assessment Toolkit (DAT)
 - The SPoRT team has partnered with NOAA/NWS DAT developers, imagery providers, and end users to integrate imagery into the DAT to complement other tools in the survey process.
 - Parks Camp, Paul Kirkwood, Keith Stellman, Ira Graffman, Jay Laseman, Kelsey Angle, Brioney Coleman, Rynn Lamb (USGS), Brian Walawender
- Imagery are provided by NASA, NOAA, and USGS for integra'on and DAT display.



Data Dissemination and Use Case

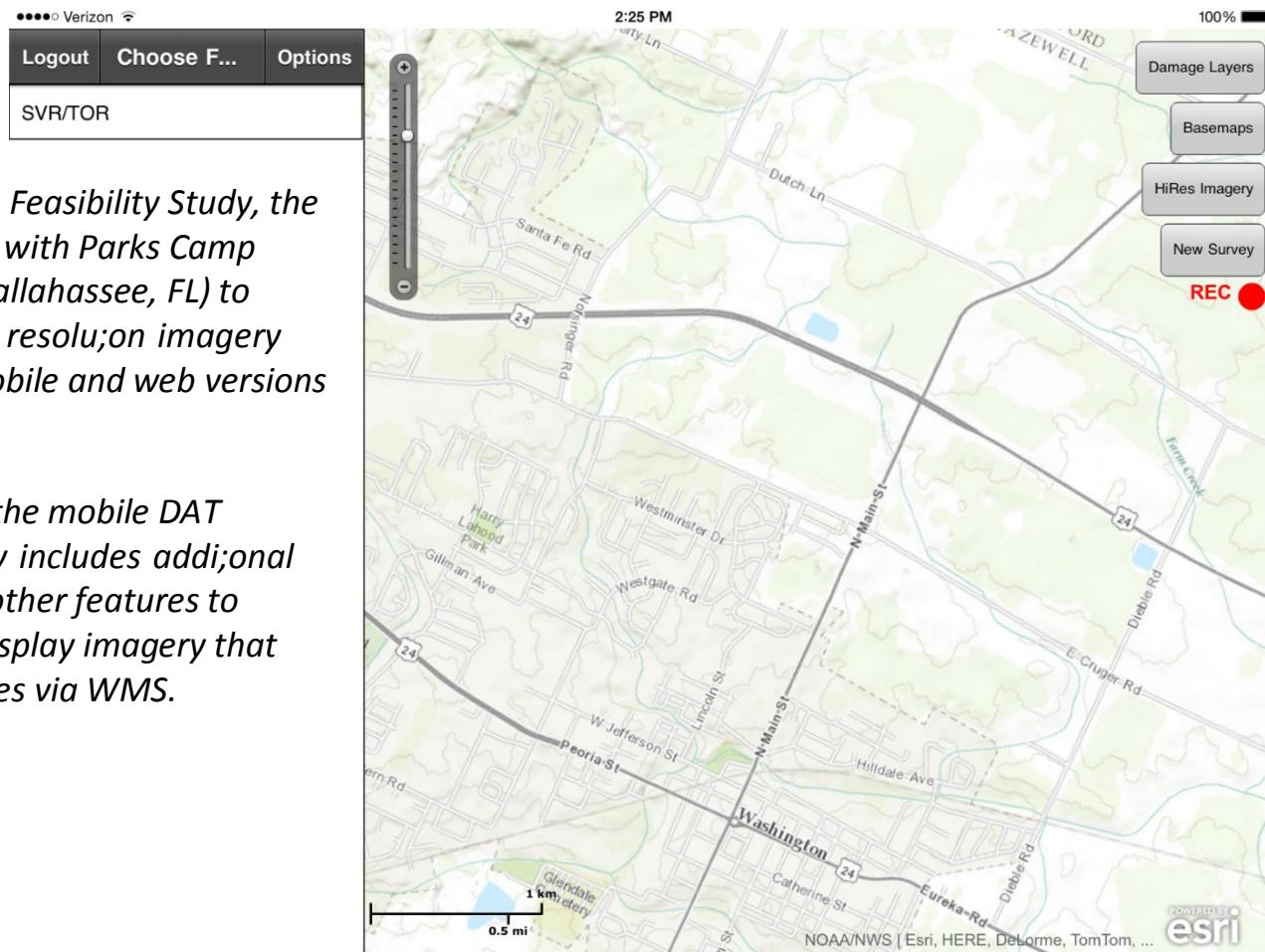


Damage Assessment Toolkit

(Mobile Client)

As part of the Feasibility Study, the team worked with Parks Camp (NWS WFO Tallahassee, FL) to integrate full resolution imagery within the mobile and web versions of the DAT.

Shown here, the mobile DAT interface now includes additional buttons and other features to search and display imagery that SPoRT provides via WMS.

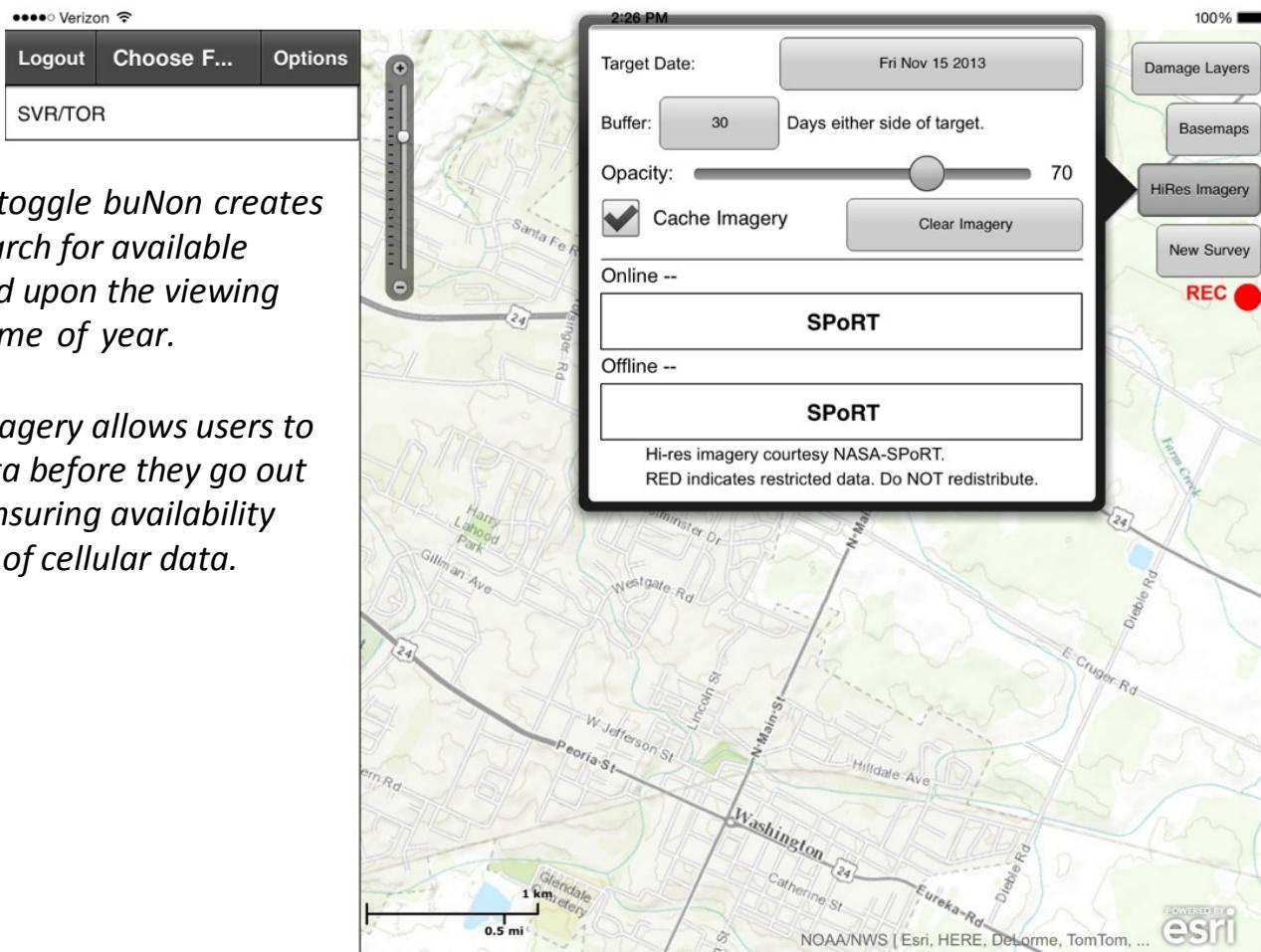


Damage Assessment Toolkit

(Mobile Client)

An additional toggle button creates a menu to search for available imagery based upon the viewing location and time of year.

Caching of imagery allows users to download data before they go out to the field, ensuring availability despite a loss of cellular data.

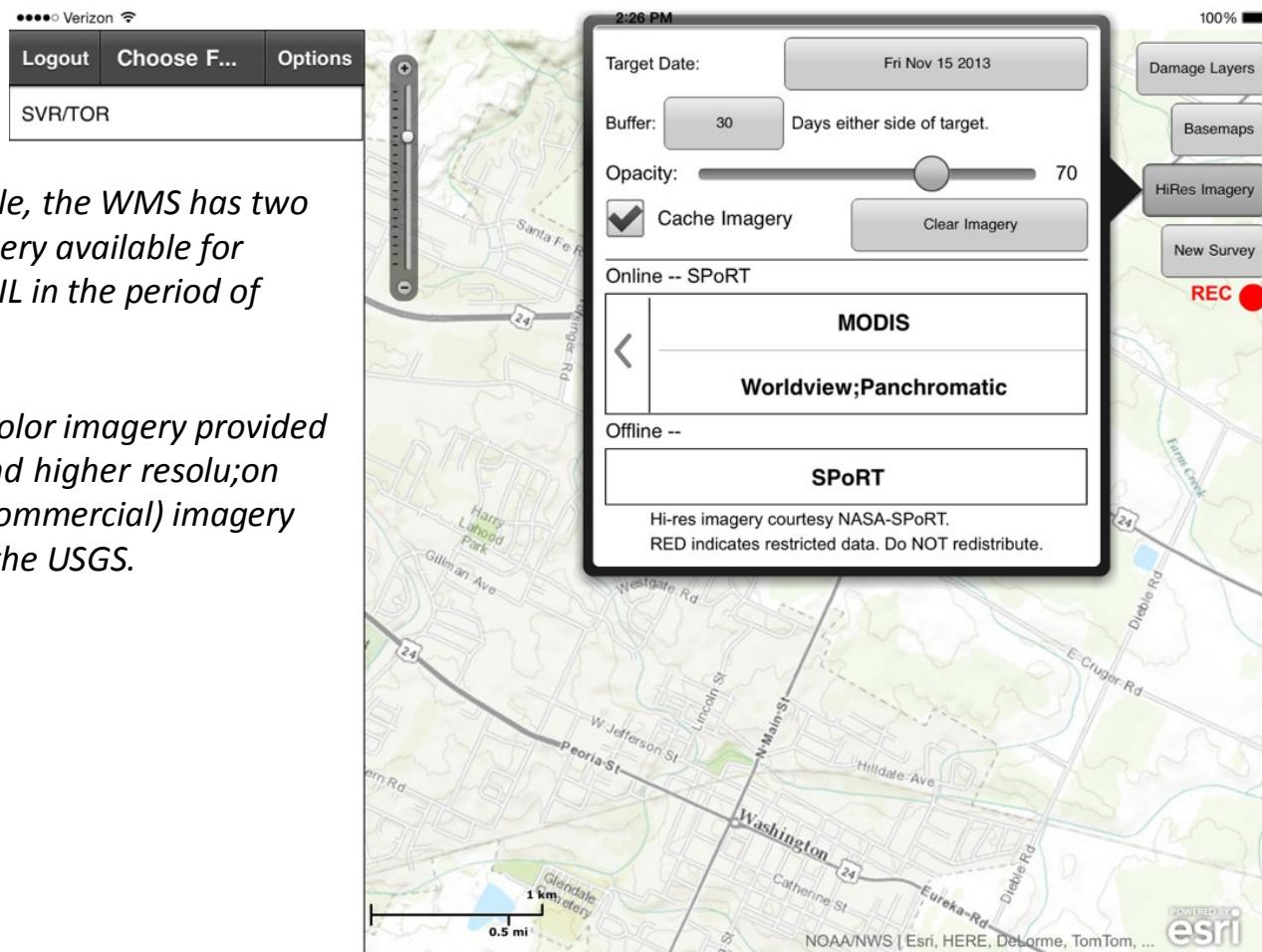


Damage Assessment Toolkit

(Mobile Client)

In this example, the WMS has two types of imagery available for Washington, IL in the period of interest:

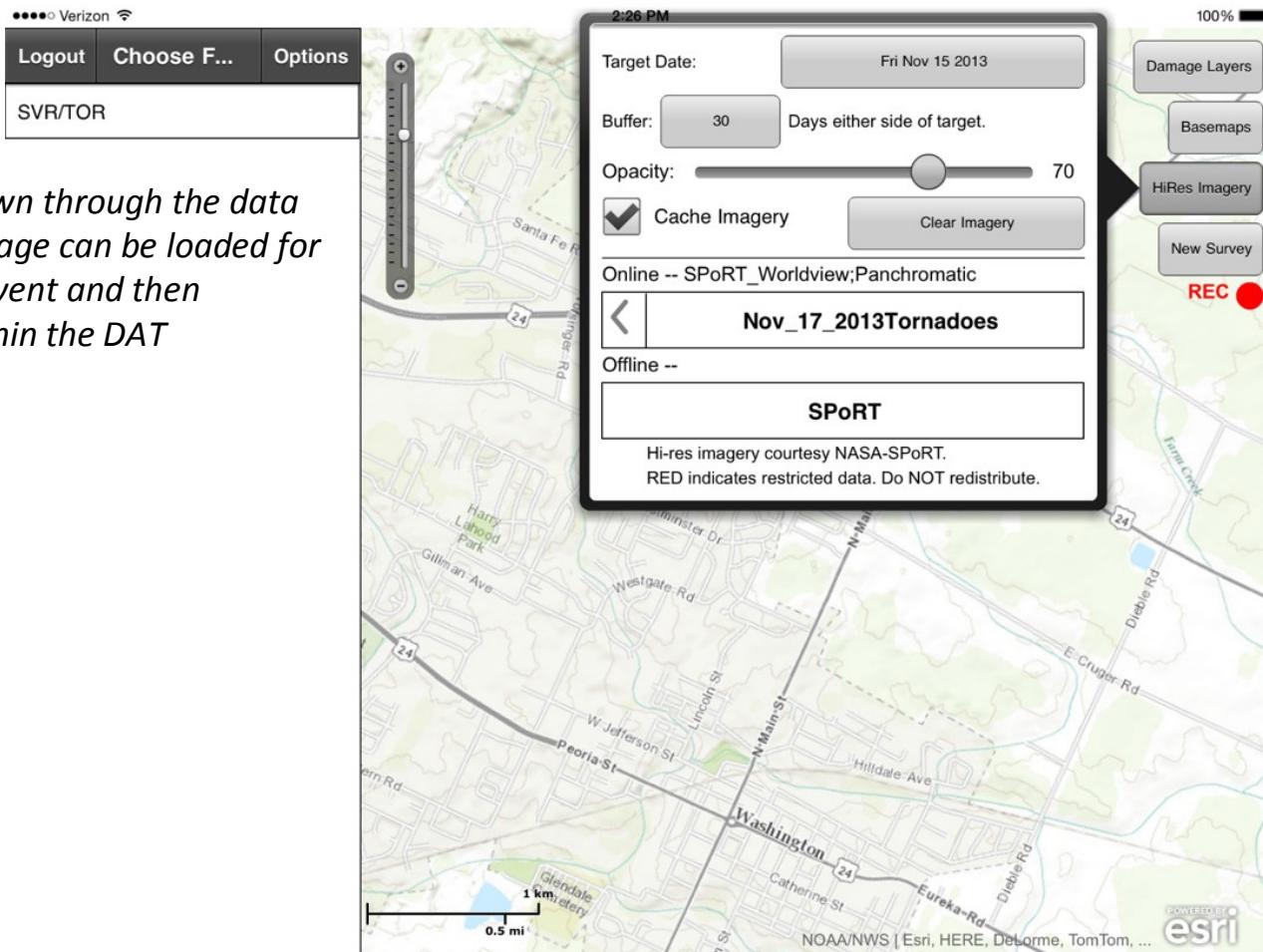
MODIS true color imagery provided via SPoRT, and higher resolution Worldview (commercial) imagery provided via the USGS.



Damage Assessment Toolkit

(Mobile Client)

By drilling down through the data menus, an image can be loaded for this specific event and then displayed within the DAT application.

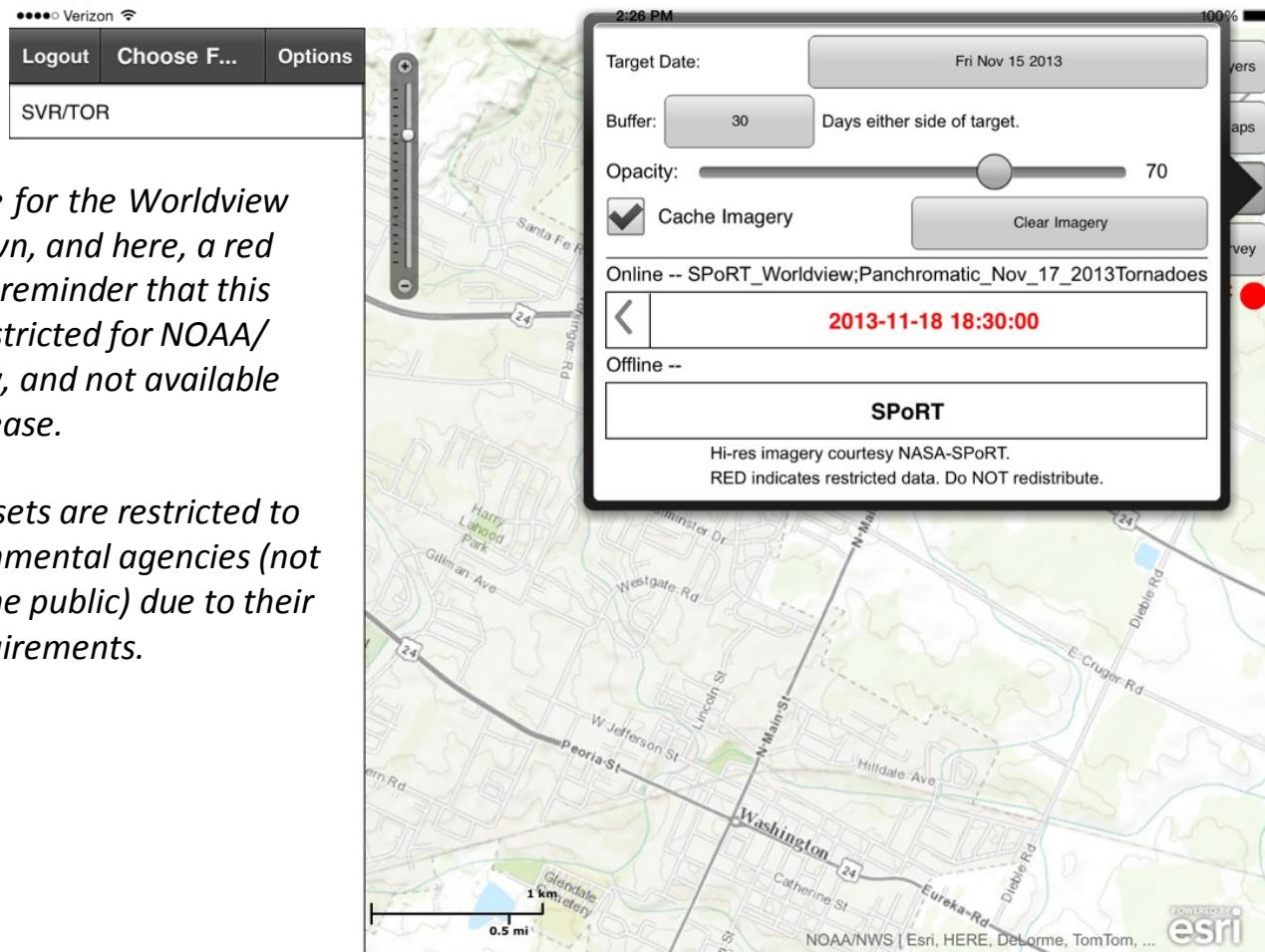


Damage Assessment Toolkit

(Mobile Client)

Date and time for the Worldview image is shown, and here, a red text view is a reminder that this imagery is restricted for NOAA/NWS use only, and not available for public release.

Certain data sets are restricted to use by governmental agencies (not released to the public) due to their licensing requirements.



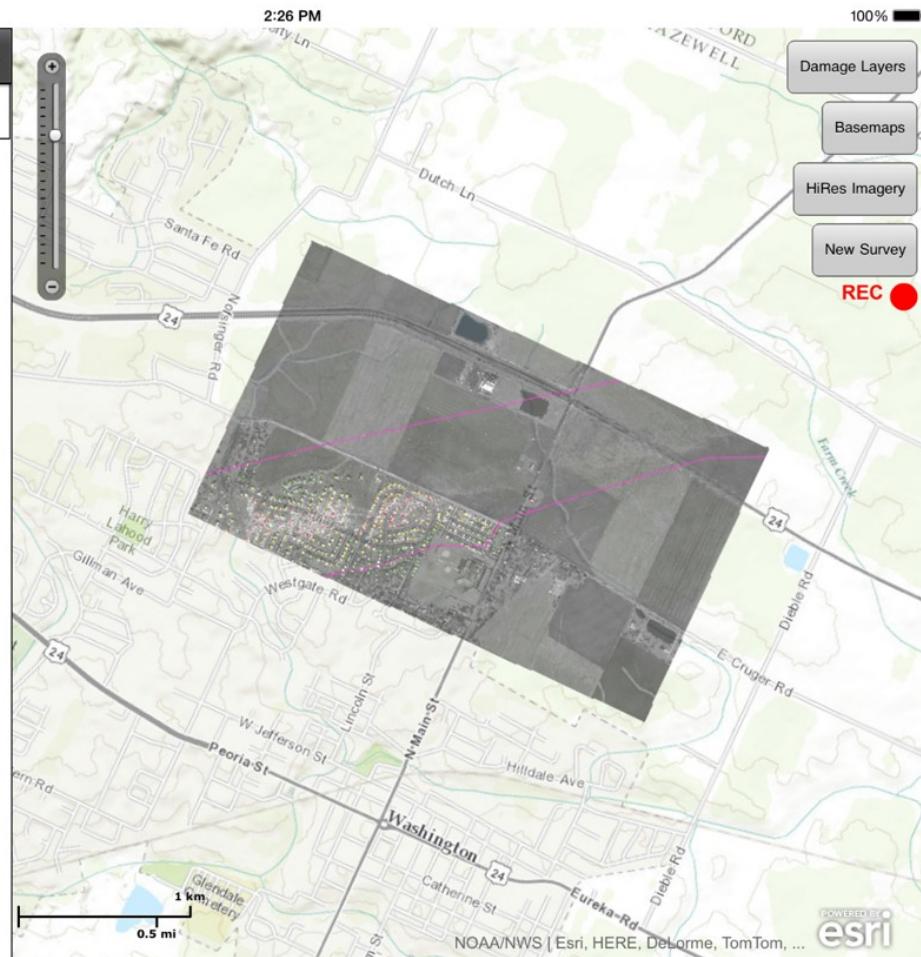
Damage Assessment Toolkit

(Mobile Client)



When loaded, this Worldview example provides the original grayscale image along with value added damage analysis provided by UAH graduate student and SPoRT team member Jordan Bell.

Colored points identify areas of varying degree of damage, and the pink outline is an estimate of the path based upon imagery analysis.



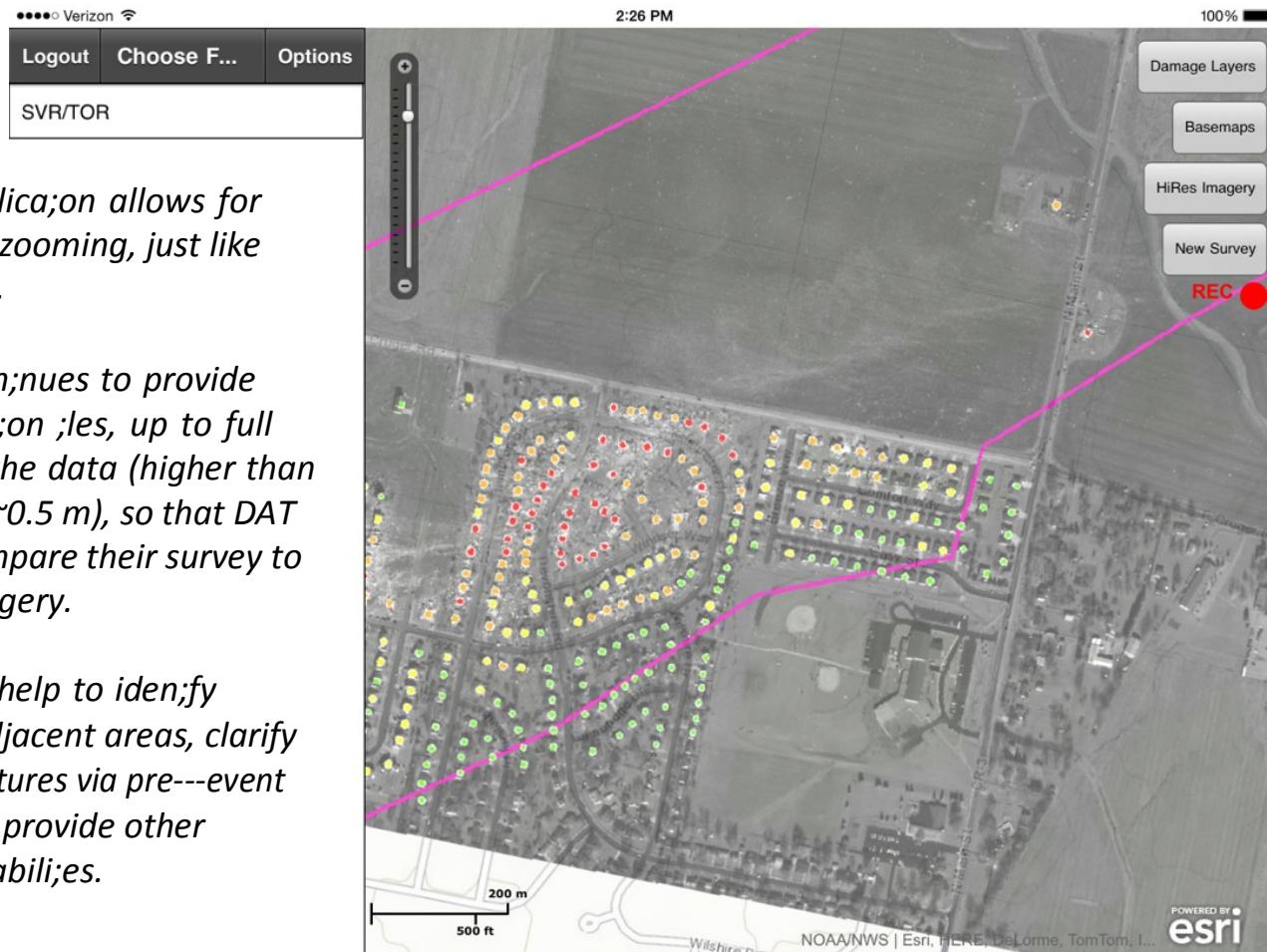
Damage Assessment Toolkit

(Mobile Client)

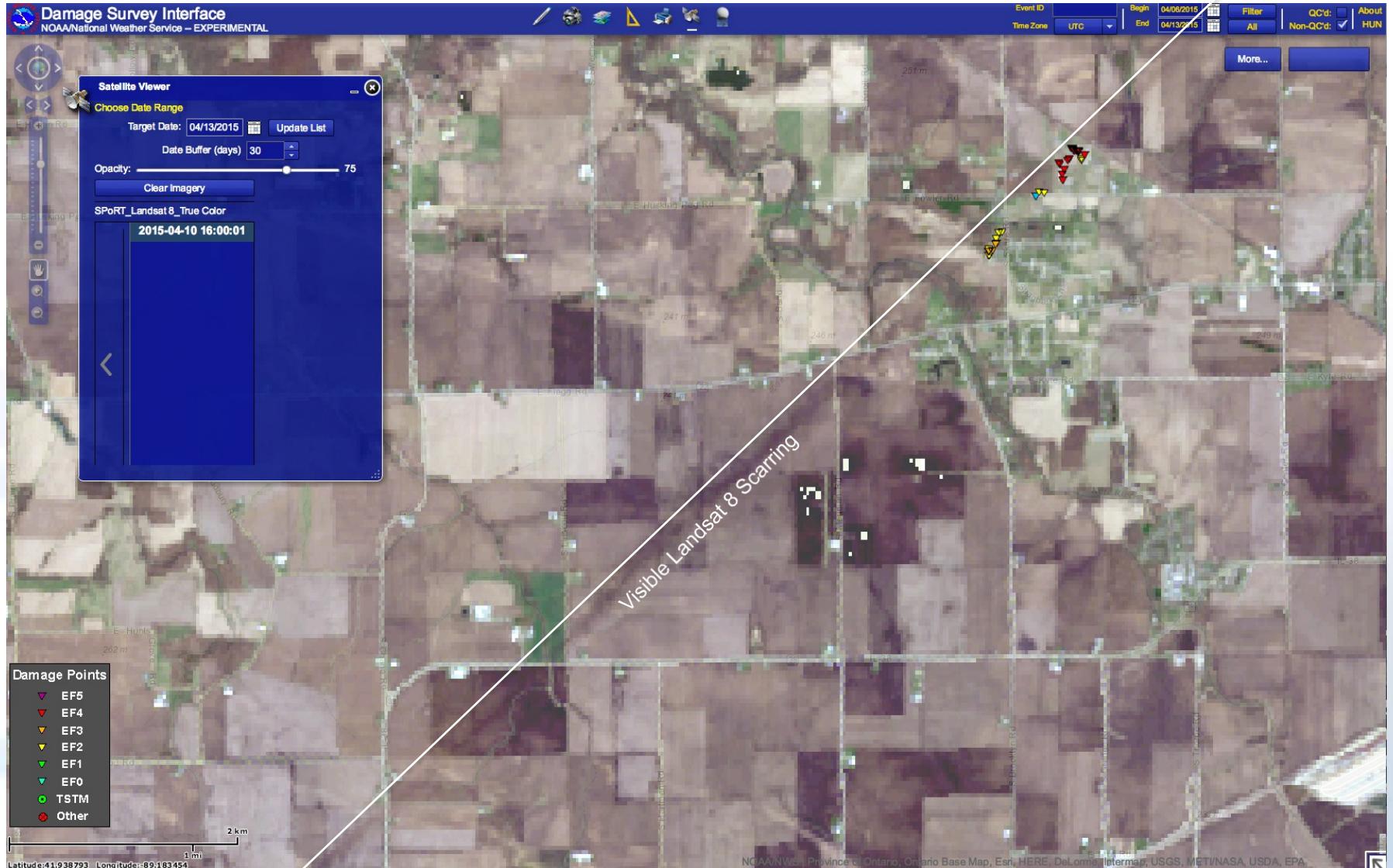
The DAT application allows for pinching and zooming, just like Google Maps.

The WMS continues to provide higher resolution tiles, up to full resolution of the data (higher than shown here, ~0.5 m), so that DAT users can compare their survey to available imagery.

Imagery can help to identify damage in adjacent areas, clarify previous structures via pre-event imagery, and provide other analysis capabilities.



Highlights



Meteorologists at NWS WFO in Chicago, IL analyze Landsat 8 imagery within the NOAA/NWS Damage Assessment Toolkit, and are “very excited and impressed” by this capability.

Highlights



The Weather Channel Twitter profile:

The Weather Channel (@weatherchannel) • 46.2K tweets • 6,787 following • 918K followers • 3,319 favorites • 26 lists

Tweets [Tweets & replies](#) [Photos & videos](#)

The Weather Channel @weatherchannel · 9m
RT @WxDiz: Satellite Imagery showing the path of the #Rochelle #Fairdale #tornado #ilwx HT @NASA_SPoRT

LANDSAT 8 IMAGERY APRIL 10, 2015 MSFC:NASA SPoRT/USGS Fairdale Lindenwood Rochelle IL

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LANDSAT 8 IMAGERY APRIL 10, 2015 MSFC:NASA SPoRT/USGS Fairdale Lindenwood Rochelle IL

The Weather Channel @weatherchannel · Apr 10
RT @WxDiz: Satellite Imagery showing the path of the #Rochelle #Fairdale #tornado #ilwx HT @NASA_SPoRT

53 40

Landsat 8 imagery was viewed at @NASA_SPoRT and @weatherchannel over 65,000 times.

Highlights



PUBLIC INFORMATION STATEMENT • . UPDATED
NATIONAL WEATHER SERVICE CHICAGO IL
1247 AM CDT WED APR 15 2015

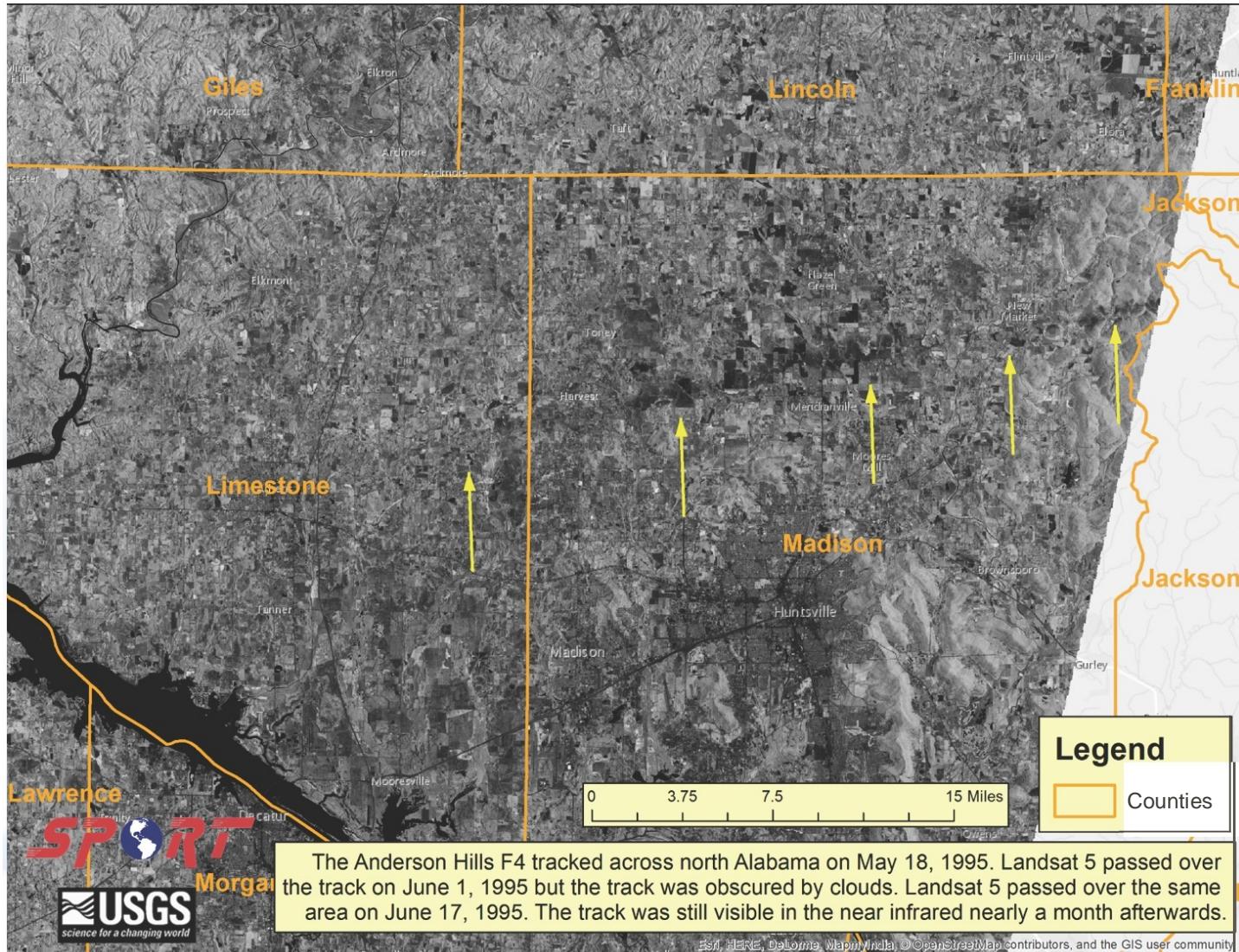
.• .NWS DAMAGE SURVEY RESULTS FOR 04/09/15 TORNADO EVENT .• .

NWS METEOROLOGISTS HAVE NOW CONFIRMED SEVEN TORNADOES ACROSS NORTH CENTRAL ILLINOIS FROM THE EVENING OF APRIL 9. NWS CHICAGO WOULD LIKE TO EXPRESS APPRECIATION TO NASA SPoRT FOR THE SATELLITE IMAGERY • .NOAA REMOTE SENSING DIVISION FOR THE HIGH RESOLUTION AREAL PHOTOGRAPHY • .THE CIVIL AIR PATROL FOR AREAL PHOTOGRAPHY • .AS WELL AS THE ILLINOIS STATE POLICE AND THE MCHENRY COUNTY EMERGENCY MANAGEMENT AGENCY FOR THEIR AREAL DAMAGE PHOTOS AS WELL. ALL OF THIS REMOTE SENSING DATA ALONG WITH THE GROUND SURVEYS WERE INSTRUMENTAL IN IDENTIFYING THE TORNADO PATHS LISTED BELOW AS WELL AS THE DAMAGE INTENSITY.

THE FIRST TORNADO WAS SPAWNED OVER FAR SOUTHEAST WINNEBAGO COUNTY INTO BOONE COUNTY BY THE FIRST SUPERCELL THUNDERSTORM • .WHILE THE NEXT SIX TORNADOES FORMED FROM ONE POWERFUL AND LONG DURATION SUPERCELL STORM • .INCLUDING THE VIOLENT LONG TRACK EF-4 FROM NORTHERN LEE COUNTY .. THROUGH OGLE AND DEKALB COUNTIES • .AND ENDING IN FAR SOUTHERN BOONE COUNTY .

Staff at the Chicago forecast office expressed appreciation to the NASA MSFC/SPoRT team for their assistance in providing satellite imagery supporting the survey efforts.

Highlights



SPoRT provided NWS Huntsville, Alabama with a revisit to the Anderson Hills F4 damage track from 1995, where Landsat scarring differs in some areas from the previously established track.

Highlights



SPOT Imagery Used to Revise Damage Survey Track

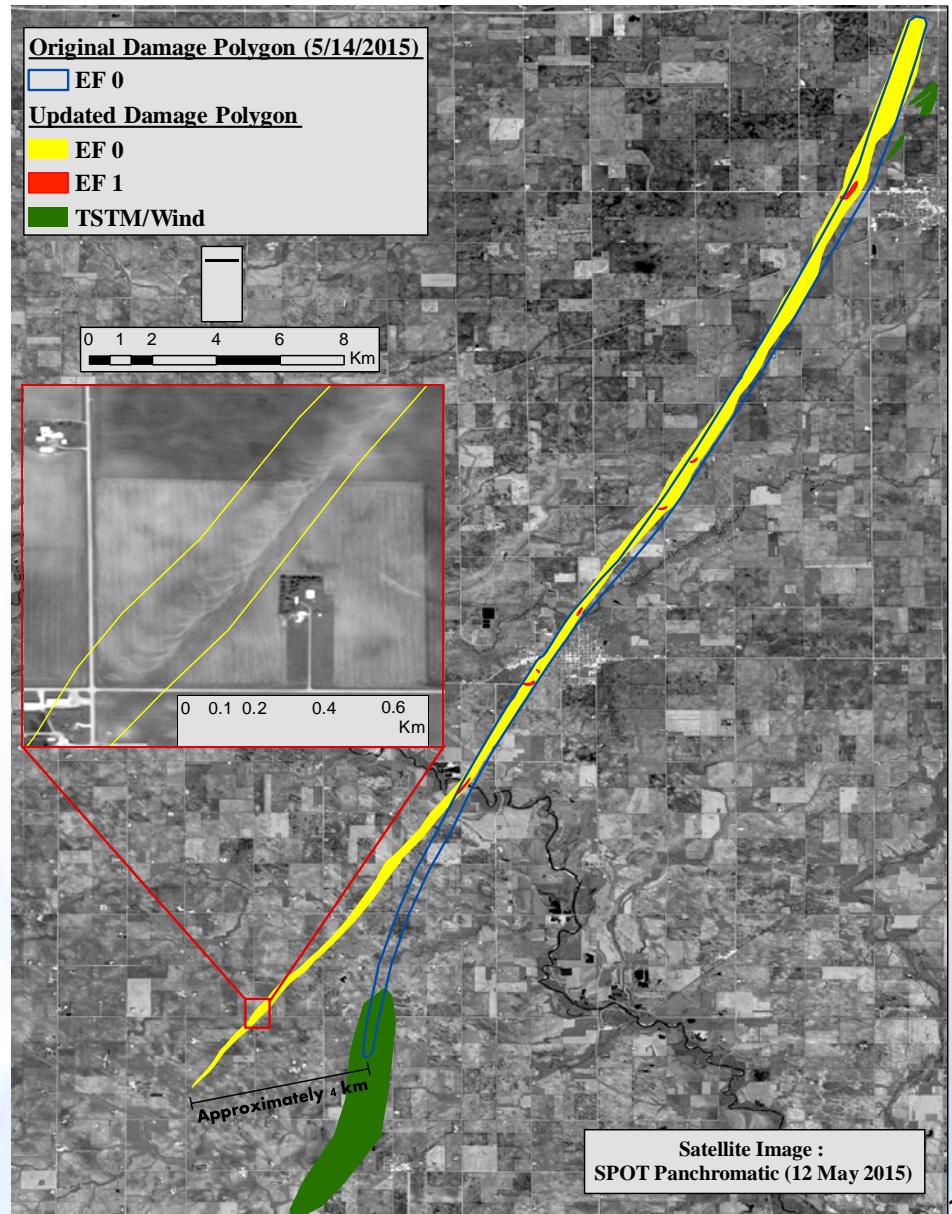
Imagery provided by the USGS and to the NOAA/NWS Damage Assessment Toolkit (via SPoRT) was used to refine an initial damage survey performed by the NWS forecast office in Des Moines, Iowa.

In the image to the right, the original damage survey (blue outline) was revised further to the southwest due to the appearance of field scarring by the tornado, evident in the inset zoomed image (red box). The initial track connected EF1 damage to thunderstorm wind damage due south, whereas the inclusion of SPOT imagery allowed for the track to be reassessed and modified to the correct location.

User Feedback (emphasis ours):

"The modifications you are seeing in the DAT are a **direct result of what we found in the satellite data**. A second storm produced wind damage within a few miles of the actual tornado path that same night. The ground survey team thought that this damage might be from the tornado. However, the satellite data showed that the path was further to the NW. The satellite data also helped us fine tune the path north of Lake City. **The satellite data has proven once again to be a great asset for our storm surveying operations.**"

Figure created by the SPoRT Disaster Response Team.



Ques'ons?

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